THE STATE OF ONONDAGA LAKE

2001

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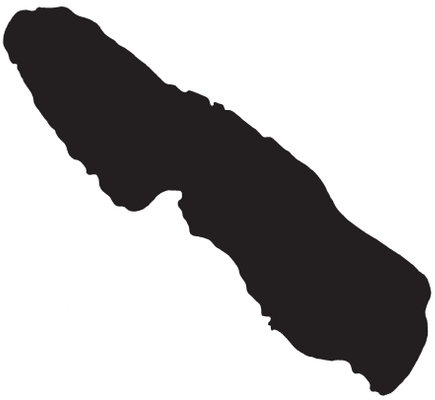


The State of Onondaga Lake

Onondaga Lake

1

What is the State of Onondaga Lake?

Onondaga Lake is one of the most polluted lakes in the United States. The lake's present condition is the result of more than a century of domestic and industrial pollution. Inadequate sewage treatment led to a swimming ban in 1940. In 1970, fishing was also banned because of mercury contamination. Although catch and release fishing is now allowed, the New York State Health Department has issued an advisory that limits eating fish caught from Onondaga Lake. *(see pg. 11)*

Onondaga Lake is not damaged to a point beyond repair. Its water quality and the condition of its waterfront have improved significantly since the passage of the Clean Water Act in 1972. Allied Corp. (Honeywell), a major industrial discharger located on the west shore of the lake, shut down in 1986. While the lake has improved significantly since the company closed its facility, problems associated with the manufacturing operations remain. Mercury and other toxic contaminants have been detected in the lake's sediments and aquatic life. Although the lake's pre-Columbian (before Christopher Columbus) salt content might have been higher than in other area lakes, wastebeds continue to elevate the lake's salt content. The Onondaga County Metropolitan Syracuse Wastewater Treatment Plant (METRO)

Where is Onondaga Lake?

Onondaga Lake is located along the northern end of the City of Syracuse in Onondaga County, New York. The lake's watershed is located almost entirely within Onondaga County.

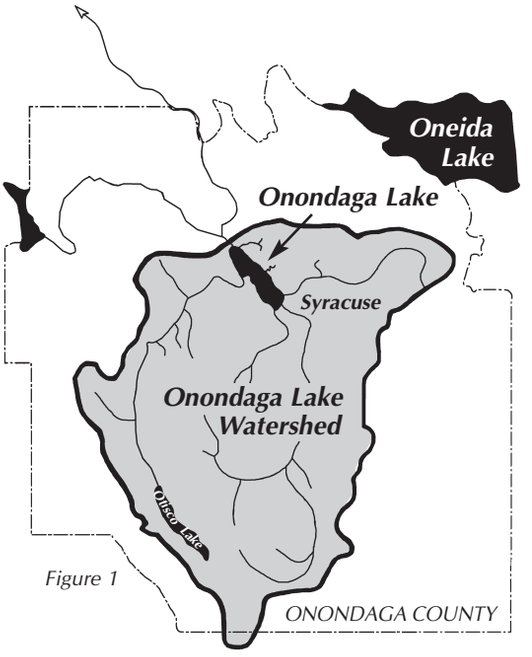


Figure 1

The lake covers an area of 4.6 square miles, has a mean depth of 35 feet and a maximum depth of 63 feet. It is approximately one mile wide and 4.6 miles long, and receives water from a land area, *drainage basin*, of 248 square miles located almost entirely within Onondaga County *(see Figure 1)*.

The major natural tributaries to the lake are Nine Mile Creek and Onondaga Creek which together account for about 70% of the total amount of water that flows into the lake each year. Other natural tributaries to the lake are Ley Creek, Harbor Brook, Saw Mill Creek and Bloody Brook. Onondaga County's Metropolitan Syracuse Wastewater Treatment Plant (METRO) is the third largest source of water to the lake making up 20% of the lake's annual inflow *(see Figure 2)*. This large proportion of treated wastewater is a unique feature of Onondaga Lake and a leading source of its continuing water quality problems. During the summer, when the amount of water flowing into the lake

discharges treated domestic and industrial wastes directly into Onondaga Lake. Due to the plant's design and size, it releases phosphorus and ammonia to the lake in quantities which contribute to water quality problems. *Phosphorus* inputs from METRO and other sources stimulate the excessive growth of algae in the lake. This decreases the lake's water clarity and eventually causes the loss of oxygen in the lake's bottom waters. *Ammonia* is discharged into the lake from METRO in amounts that can be harmful to fish. During storm periods, a mixture of raw sewage and street runoff overflows from the sewer system releasing harmful bacteria and viruses to several of the lake's tributaries.

Scientists continue to research and monitor Onondaga Lake in an attempt to understand how it has been affected by pollution. Their findings have been compiled into a single nine-chapter *State of the Lake Report.* These findings have also been widely published in scientific and engineering journals.

This booklet provides a general review of the information about the pollutants found in Onondaga Lake and their effects on the lake ecosystem. In addition to the *State of the Lake Report*, other reference material have been used to further explain some key concepts of lake science. This booklet is intended to foster an understanding of the lake's problems, to assist the public in helping develop solutions to improve the water quality of Onondaga Lake. ◆

from natural tributaries is low, the discharge from METRO represents the single largest contribution of water to Onondaga Lake.

Tributaries to Onondaga Lake flush the lake (replacing old water with new water) rapidly compared to most other lakes. This happens approximately 4 times each year. Its rapid rate of flushing will benefit the cleanup of Onondaga Lake because the lake will respond quickly to reductions in pollution inputs.

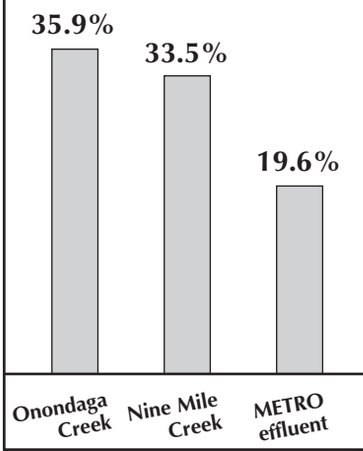
Water flows out of Onondaga Lake into the Seneca River through a single outlet at its north end. The Seneca River combines with the Oneida River at Three Rivers Junction to form the Oswego River. The Oswego River then flows north into Lake Ontario approximately 40 miles downstream from the Onondaga Lake outlet.

In most areas of New York State, waterfront property (particularly urban waterfront property) is in great demand. By contrast, Onondaga Lake's waterfront remains largely undeveloped. The full potential for resource development of Onondaga Lake is negatively affected by poor water quality, contaminated shoreline areas, incompatible uses and economic considerations. Public parklands around the lake are well used, but not for water-based recreation like swimming, waterskiing or windsurfing. Also, recreational boating and fishing lag because of the lake's image and lack of public access.

Unlike most upstate New York lakes, no residential properties are located along the shoreline of Onondaga Lake. In fact, most of the land immediately surrounding Onondaga Lake is owned by Onondaga County, and is devoted to parkland. While several inactive hazardous waste sites from past industrial activities are located on the lake's southern and western shorelines, the northern and eastern shores of the lake include picnic areas and playgrounds. The Onondaga Lake Park experiences over one million visits a year. An 80-slip marina and a bicycle and pedestrian trail are also part of the County's lake park system. The goal is to completely encircle the lake with County Park. In addition, the Syracuse Inner Harbor is undergoing a transformation as a major urban waterfront development area including recreation, commercial/office, and residential uses. ◆

Long-Term Annual Contributions of Water to Onondaga Lake

Figure 2



Source of flows: Onondaga County Department of Drainage and Sanitation 7/97 Data used: METRO: 1/87-10/92, 10/93-12/96; Onondaga Creek and Harbor Brook: 10/61-12/96; Nine Mile Creek: 1/73-12/96; Other flows: from Crucible and AlliedSignal Inc. 1993-1996 records.

The Stratification Cycle

Lakes in the northeastern portion of the United States the size and depth of Onondaga Lake annually experience thermal stratification. **Thermal Stratification** *is the layering of warm water over more dense (heavier) cold water. This occurs during the summer as the heat from the sun warms the upper layers of the lake. When the air temperature cools during the fall, stratification is eliminated and the top and bottom water mix as colder air and higher winds make the water temperature and density uniform throughout the lake. This condition is referred to as* fall turnover. *With the onset of spring, the lake's ice cover melts and the sun warms the lake's water making the temperature uniform from top to bottom. This period of mixing is referred to as the* spring turnover. ◆

A Historical Perspective

By the end of World War I, a thriving resort industry around the Onondaga Lake shoreline has completely collapsed due largely to the combination of sewage and industrial pollution of the water and land.

Man appears in Onondaga County in 8000 BC following the retreat of the last glaciers.

As the population of Onondaga County and the City of Syracuse grows during the early 20th Century, large volumes of untreated sanitary sewage and storm water are discharged to Onondaga Lake.

1600 1800 1900 1940 1970

1654
Explorers discover salt springs on the shores of Onondaga Lake.

1783
Revolutionary War ends. European settlements develop in Central New York.

1793
Commercial salt production begins on the lakeshore.

1822
Lake level is lowered for drainage of Syracuse swamps.

1880
Onondaga Lake is a popular resort area. The west shore of the lake has many hotels, parks and bathing beaches. Swimming, boating and fishing are common activities during the summer season.

1884
Solvay Process Company (later to become Allied Chemical and Dye Corp., Allied Chemical Corp., Allied Corp., Allied-Signal Inc., AlliedSignal Inc. and Honeywell International, Inc.) begins production of soda ash.

1896
City builds sewers and bans backyard privies. Sewage flows directly into Onondaga Creek and Harbor Brook.

1901
Ice harvesting is prohibited.

1918
Solvay Process Company begins production of organic chemicals.

1920
Solvay Process Company merges with four other companies and forms Allied Chemical and Dye Corp.

1925
City of Syracuse begins the removal of settleable solids from sewage (primary treatment).

1940
Swimming is banned.

1946
Allied Chemical and Dye Corp. begins chlorine production by the mercury cell process. Mercury wastes are discharged directly into the lake.

1958
Allied Chemical and Dye Corp. changes its name to Allied Chemical Corporation.

1960
Construction of the Onondaga County Metropolitan Syracuse Wastewater Treatment Plant (METRO) is completed.

1970
Fishing is banned. Due to the discovery of mercury in the lake fishery, the U.S. Attorney General sues Allied Chemical Corp. to stop mercury dumping. The amount of mercury discharged to the lake is calculated to be 22 pounds per day.

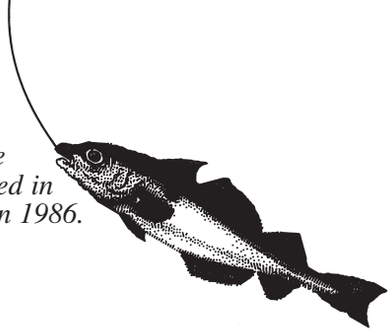
1971
Onondaga County bans high phosphorus in laundry detergents.

1973
New York State bans phosphorus in laundry detergents.

1977
Allied Chemical Corp. closes chlorinated benzene plant and Willis Avenue chlor-alkali plant.

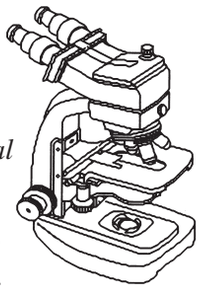
1979
METRO is upgraded to secondary and tertiary treatment.

Catch and release fishing is reinstated in Onondaga Lake in 1986.



The Amended Consent Judgment is signed in Federal Court on January 20, 1998.

The 1970s marks the beginning of the restoration of Onondaga Lake. Scientific studies are conducted relating to the impact of industrial wastes, combined sewer overflows and treated sewage wastes discharged to the lake.



The Onondaga Lake Management Conference is established under the Great Lakes Critical Programs Act of 1990. "A Plan of Action" is drafted in 1993. Congress passes the Water Resources Development Act of 1999 that replaces the Management Conference with the Onondaga Lake Partnership.

1980 1990 1995 1997 2000

º1981
Allied Chemical Corp. changes its name to Allied Corp.

1986
Allied Corp. closes soda ash manufacturing operations.

1987
Onondaga County implements best management practices for sewer interception. Combined sewer overflows are reduced by 90%.

Allied Corp. merges with Signal Companies and forms Allied-Signal Inc.

1988
Atlantic States Legal Foundation, New York State Attorney General and Department of Environmental Conservation file complaint against Onondaga County Department of Drainage and Sanitation alleging violation of its state discharge permit. LCP-Hanlin shuts down Bridge Street chlor-alkali plant due to illegal dumping of mercury.

1989
New York State Attorney General and Department of Environmental Conservation file a complaint against Allied-Signal Inc. for pollution violations and resource damage.

1990
Onondaga Lake Management Conference is convened in Syracuse by U.S. Senator Daniel Patrick Moynihan.

1991
Onondaga Lake Management Conference begins lake research and remediation projects. Pump stations at Liverpool and Ley Creek are modified to eliminate raw sewage overflows to the lake.

1992
U.S. Army Corps of Engineers completes the *Onondaga Lake Water Quality Technical Report* outlining possible lake remediation alternatives. The Onondaga Lake Management Conference funds a major study of mud-boil effluents and potential remedial solutions. Mud discharges to Onondaga Lake average 30 tons a day.

Allied-Signal Inc. becomes AlliedSignal Inc.

1993
Onondaga Lake Management Conference drafts *"A Plan For Action"* which becomes the basis of the Onondaga Lake Management Plan.

1994
Onondaga Lake Management Conference begins aquatic habitat restoration projects in Onondaga Lake.

1995
The Onondaga Lake Management Conference completes mudboil remediation projects to reduce flow of sediment to Onondaga Creek. Onondaga Lake is added to the Federal Superfund National Priority List.

1996
Allied-Signal, Inc. continues Remedial Investigation and Feasibility Study of Onondaga Lake.

1997
State of New York, Atlantic States Legal Foundation and Onondaga County reach agreement (The Amended Consent Judgment) on wastewater treatment plant improvements and a schedule to attain compliance with the Clean Water Act.

The State of New York and Allied-Signal, Inc. agree to an expedited schedule for completion of the Remedial Investigation/Feasibility Study (RI/FS) process.

1998
The Federal Judge signs the Amended Consent Judgment (ACJ) ordering wastewater treatment plant improvements agreed upon by the State of New York, Atlantic States Legal Foundation and Onondaga County. The ACJ is a multiyear program with projects extending until 2012.

1999
New York State Health Department lifts ban on eating certain species of fish (bass, white perch and catfish) from Onondaga Lake. The ban remains in effect for walleye. The Health Department also maintains a health advisory that recommends anglers limit consumption to once a month. Women of childbearing age, infants and children under the age of 15 are still advised not to eat any fish from the lake.

Congressman James T. Walsh initiates legislation in the Water Resource Development Act of 1999 that replaces the Management Conference with the Onondaga Lake Partnership. (OLP). The OLP, led by the U.S. Army Corp of Engineers, is tasked with developing and improving projects consistent with the Onondaga Lake Masnagement Plan.

AlliedSignal Inc. merges with Honeywell, Inc. and changes its name to Honeywell International, Inc.

2000
The OLP holds an inaugural ceremony on the shore of Onondaga Lake, August 9, 2000.

The Use of Onondaga Lake

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How lakes are used depends on two things:

1) how people want to use the water; and
2) the lake's capacity to satisfy those desires.

Problems in a lake can be identified by the limitations they impose on how people can use the water and surrounding land. For example, the timeline on the previous page shows a time when Onondaga Lake was a hub for recreational activities. In the 19th Century, beaches and resorts flourished around the waterfront. People used the water for swimming and fishing because the lake was clear, clean and inviting.

As Syracuse grew, the lake's western shore became increasingly industrialized. Sewage disposal and industrial discharges into the lake also increased during this period, and as a result, the quality of the water began to suffer. Eventually, people stopped visiting Onondaga Lake for swimming and fishing, primarily because of the lake's degraded water quality. Over time, all of the lake's resorts and beaches closed. By World War II, the lake was mainly being used for the disposal of industrial and domestic wastes. Recreation in and around the lake mostly disappeared. Today, water quality and lake usage continue to remain closely linked.

In 1972, the federal government decided that the waters in the United States suffered from prolonged industrial and domestic pollution. To preserve and restore our waters, Congress passed the Clean Water Act that year.

New York State Water Quality Classifications for Onondaga Lake

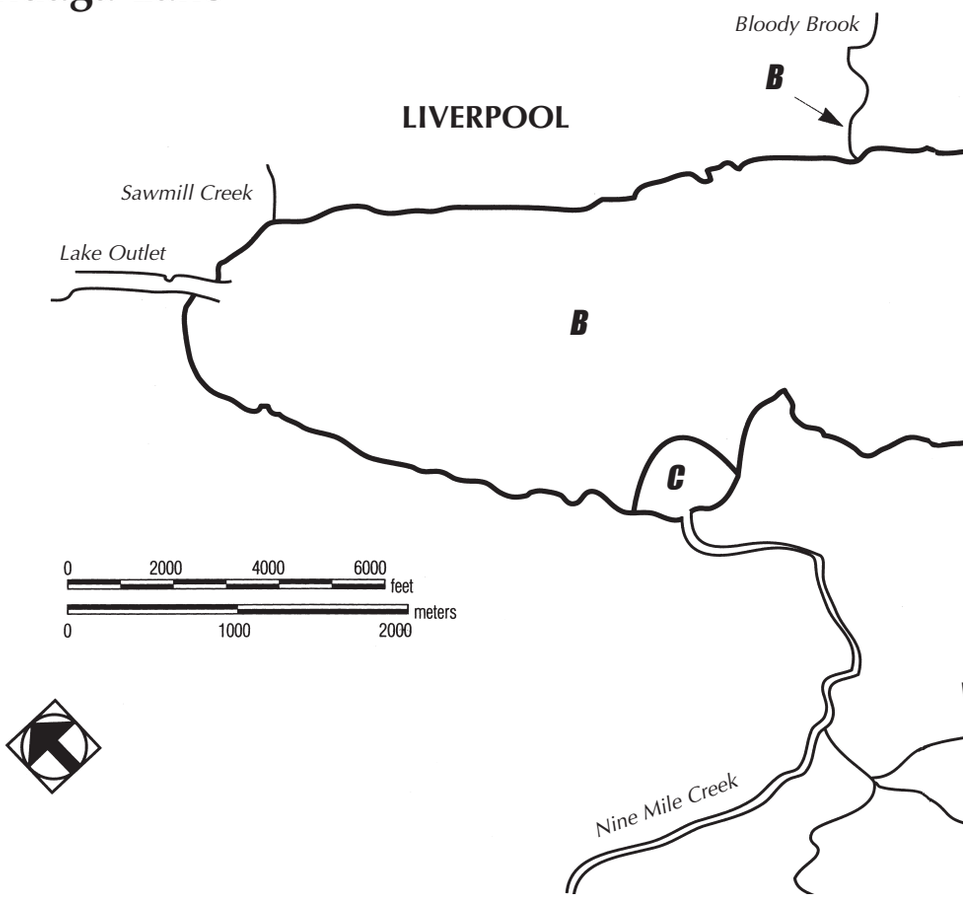
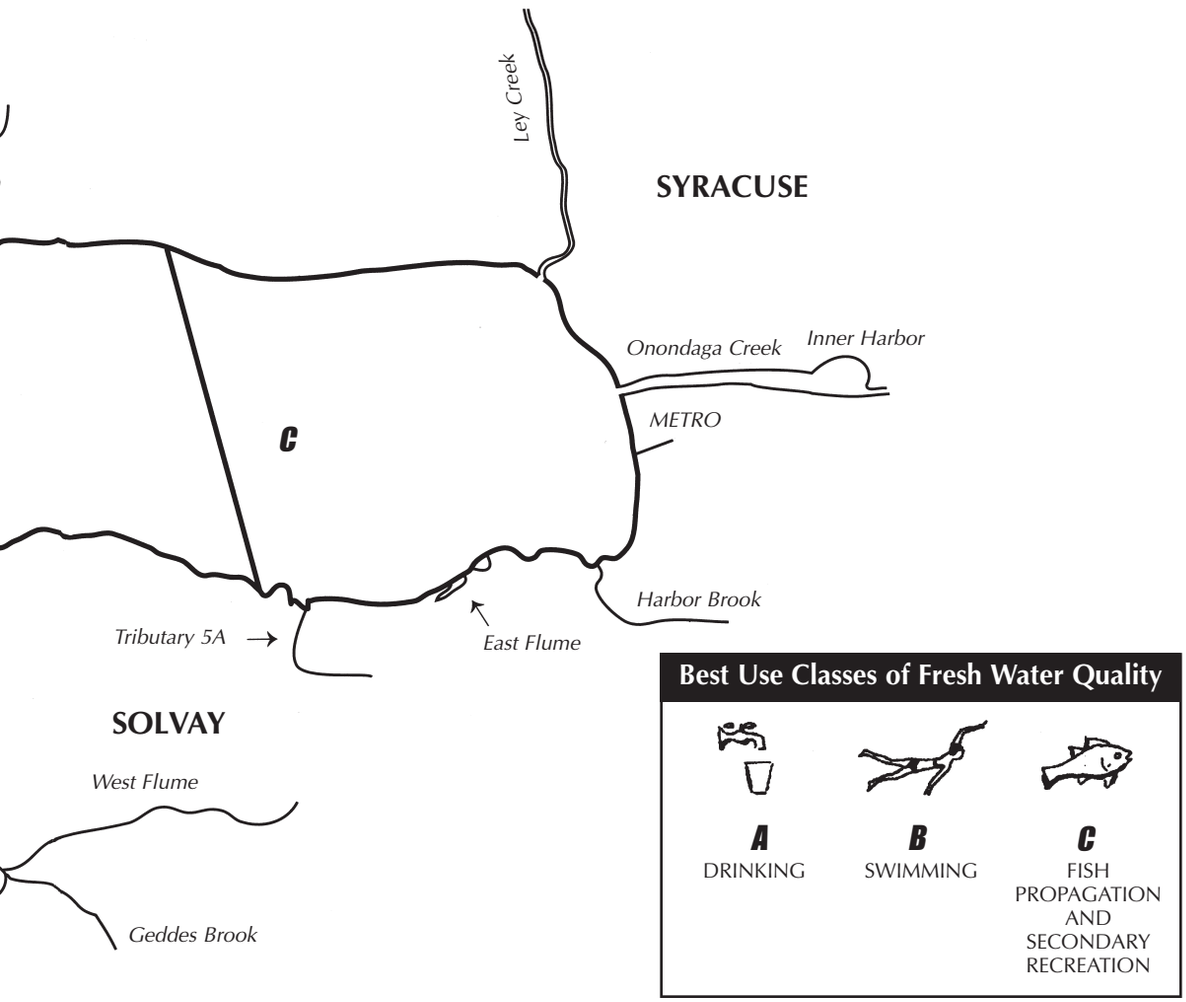


Figure 3

The Act stipulated that all United States fresh waters should be suitable for swimming and the propagation of fish and other aquatic life. In response to the Clean Water Act, New York State classified its waters as to best use, either for drinking water, swimming or fishing. *Figure 3* depicts the best use classifications of Onondaga Lake. New York State also created a system of discharge permits to control and ultimately eliminate pollution which would threaten the usage and degrade the quality of its waters.

Municipal wastewater (sewage) has been a major source of pollution to Onondaga Lake. For years, Syracuse dumped its sewage directly into the lake with little or no treatment. In 1960, Onondaga County established a sewer district and built METRO on the south shore of the lake. The County improved sewage treatment at METRO in 1979, and upgraded again in 1981. As a result, the water quality of Onondaga Lake has improved, but does not yet meet water quality standards. At the time Atlantic States Legal Foundation brought its lawsuit in 1988, wastewater discharges were still an impediment to achieving the designated uses of Onondaga Lake. Allied-Signal Inc. also has been sued by New York State for the effects of its waste disposal practices on the lake (see Mercury, page 11 and Salinity, page 13). The goal of the Amended Consent Judgment (ACJ), approved by the Federal Court on January 20, 1998, and the action brought against Allied-Signal Inc. in 1989, are intended to result in attainment of Onondaga Lake's designated uses. ◆



The Central Role Of Phosphorus

Phosphorus is an element that is important to plant nutrition. It is commonly found in high concentrations in fertilizers and sewage. The amount of phosphorus received by a lake is an important factor in determining water quality because phosphorus stimulates the growth of *algae*. Algae are microscopic green plants that live in lakes. The central role phosphorus plays in regulating water quality is illustrated in *Figure 4*.

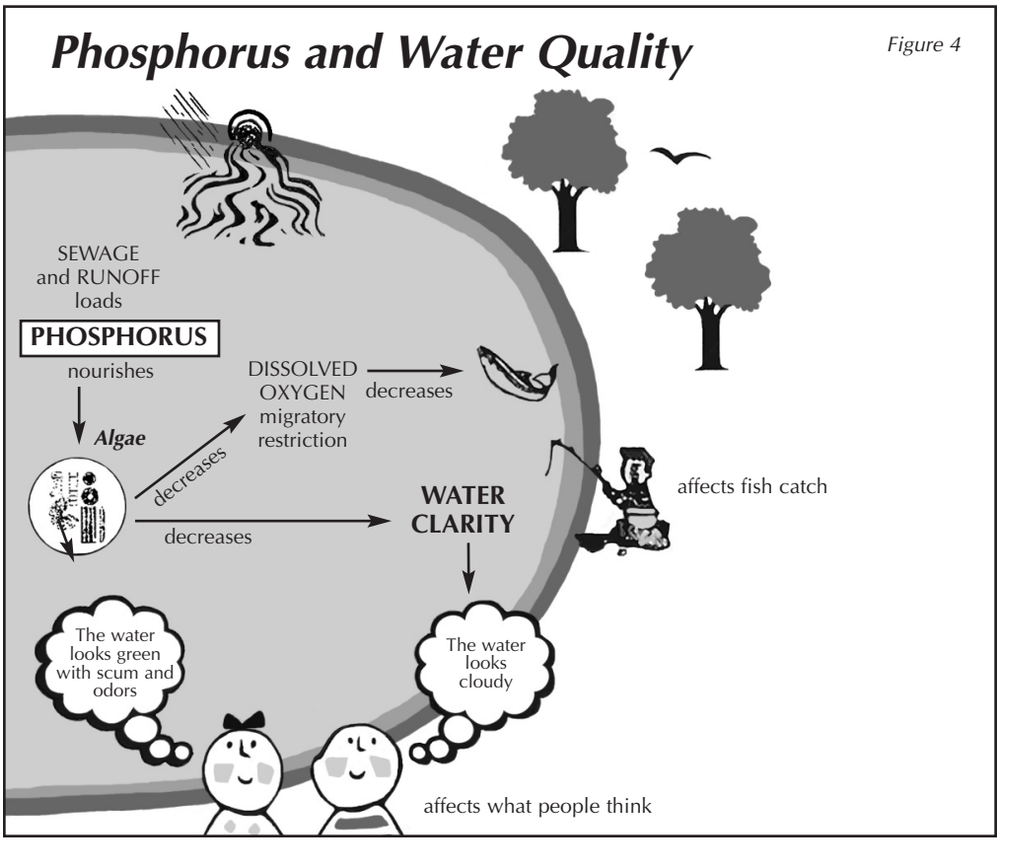


Figure 4

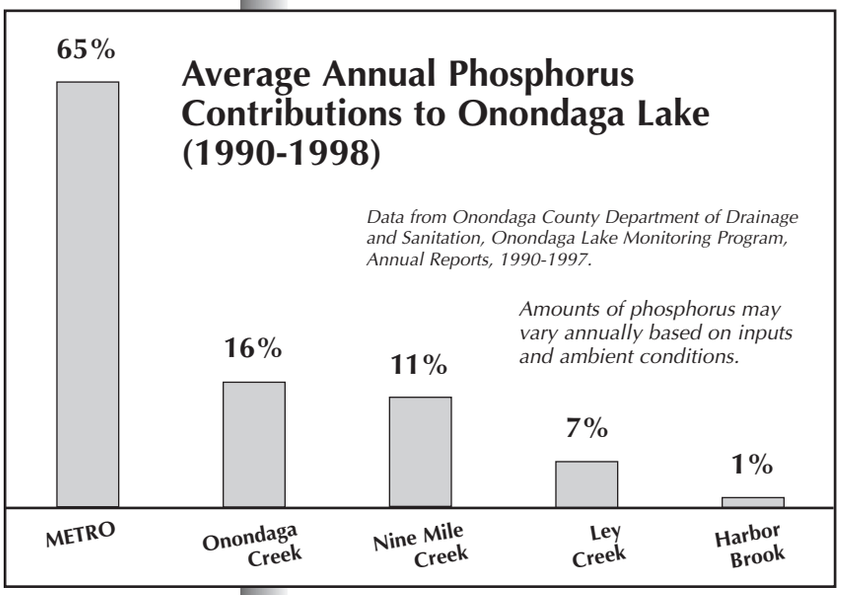
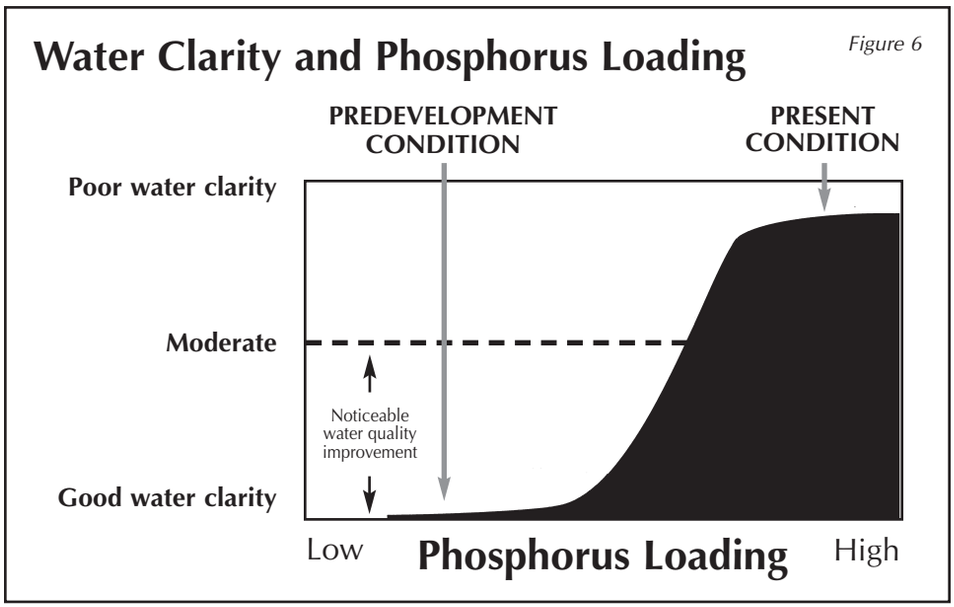


Figure 5

Phosphorus inputs to a lake are described as *phosphorus loading*. High phosphorus loading causes excessive growth of algae or *algae blooms* in Onondaga Lake throughout most of the summer. The algae give the water a cloudy, green appearance and decrease the lake's water clarity. Eventually, the algae die and sink to the bottom of the lake where they are broken down by bacteria. This process uses up oxygen necessary for fish survival in the deeper waters of the lake.

Water Clarity and Algae Blooms

One way to see the effects of phosphorus pollution in Onondaga Lake is to measure its water clarity. Scientists routinely



measure the clarity of Onondaga Lake by recording the depth at which a black and white *Secchi disk* can no longer be seen when lowered into the water.

The New York State Health Department standard for opening a beach on Onondaga Lake would require that the lake's clarity be 4 feet or greater throughout the summer. This is a matter of public safety so that people can be seen in the water. From 1970 to 1986 the lake's water clarity exceeded 4 feet only one day out of five. Currently, the clarity of Onondaga Lake exceeds 4 feet one day out of two. This improvement reflects the reductions in phosphorus loading from METRO and increased consumption of algae by small aquatic animals called *zooplankton*. However, further reductions in phosphorus and ammonia will be necessary to routinely meet the 4 foot clarity requirement for recreational swimming safety.

Sources of Phosphorus

Reductions in phosphorus loading to Onondaga Lake are necessary to correct its water clarity and oxygen problems. Targeting the major sources of phosphorus is a logical step to addressing two of the lake's most critical water quality problems. A breakdown of the existing contributions of phosphorus to the lake is presented in *Figure 5*.

Phosphorus loads fall into two categories: point and non point sources. Treated domestic and industrial wastes discharged from a pipe at METRO directly into Onondaga Lake represent a point source input. Between 1990 and 1998, METRO contributed 65% of the total phosphorus loading to Onondaga Lake.

The remaining 35% of phosphorus entered the lake from its natural tributaries. Some of the phosphorus enters the tributaries from non point sources such as runoff carried from the surrounding land. Other sources of phosphorus to the tributaries are from *combined sewer overflows* (CSOs) which discharge untreated sewage and stormwater to Onondaga Creek, Ley Creek and Harbor Brook during intense rainfall (see page 10).

The present condition plateau of Figure 6 indicates that the reductions in phosphorus loading achieved during the past 20 years have not caused enough improvement in the water clarity of Onondaga Lake. As the curve indicates, significant reductions of phosphorus loading, such as the reduction of phosphorus discharged from METRO, would result in a major improvement in the lake's overall water clarity. ◆

Why is Oxygen so Important to the Lake?

Oxygen is required for fish and other aquatic life to survive. Fish like trout, salmon, and whitefish are referred to as cold water fish because they prefer the colder, deeper lake waters. Before the turn of the century, cold water fish flourished in Onondaga Lake.

Cold water fish, which require at least 5 milligrams per liter of oxygen, can no longer survive in Onondaga Lake because of the lack of oxygen in the lower lake waters. Most of the algae produced in the upper layers of the lake ultimately settle to the bottom where algae are decomposed by bacteria and fungi. Oxygen is used up as part of the decomposition process. The greater the algae production in the upper layers, the greater the loss of oxygen from the lower layers of the lake. Presently, oxygen is lost from the bottom of Onondaga Lake very rapidly compared to other lakes. The oxygen in the lake's lower waters is gone by July.

The by-products of algae decomposition such as **hydrogen sulfide, methane** *and* **ammonia** *accumulate in the lower lake waters following the loss of oxygen. These substances are distributed throughout the lake during fall turnover. As a result, the oxygen concentration throughout the lake in some years drops below 4 milligrams per liter. These oxygen crises not only violate environmental standards, they also drive fish out of the lake outlet and into the Seneca River. Such severe annual losses of oxygen have not been reported in the upper waters of any other lakes in the United States.* ◆

Ammonia and Nitrite

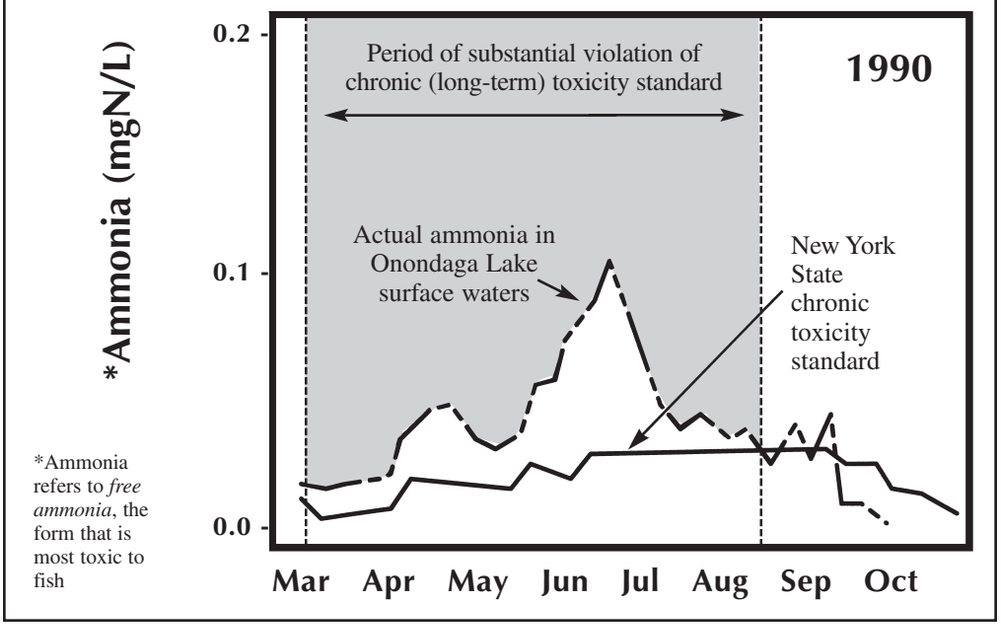
9

Contributions of ammonia from METRO result in violations of New York State Standards

Nitrogen is a basic building block of life. *Ammonia and nitrite* are forms of nitrogen which in high concentrations can be toxic to fish and other aquatic life. The concentrations of ammonia and nitrite that prevail in Onondaga Lake exceed environmental standards established to protect fish and other aquatic life from their toxic effects. *(see Figure 7)*. These standards were developed to prevent fishkills, and to protect fish spawning and free migration. Toxic concentrations of ammonia depend on a complex relationship between the amount of ammonia, pH and the temperature of the water.

Although ammonia levels may not be toxic enough to cause a fishkill in Onondaga Lake, chronic exposure to elevated ammonia levels can reduce natural fish spawning and restrict migration patterns. Ammonia concentrations also exceed New York State toxicity standards in both the Onondage Lake outlet and the Seneca River. This is caused in part by the outflow of ammonia-rich lake water to the river.

Ammonia and Fish Toxicity in Onondaga Lake *Figure 7*



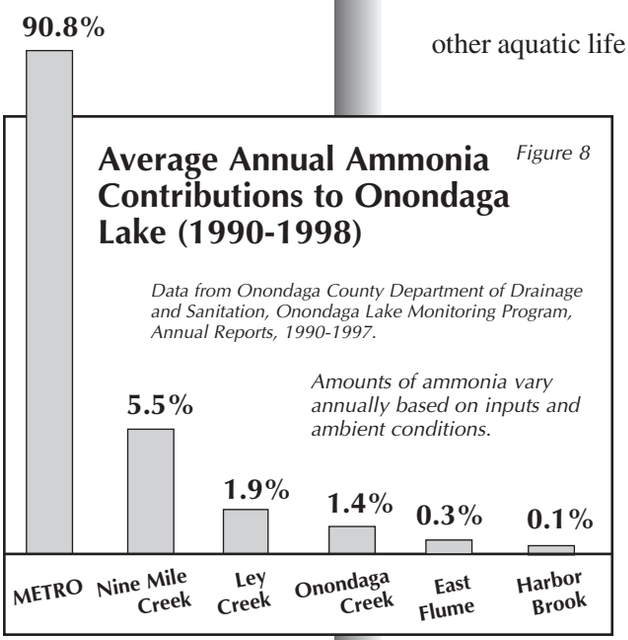
New York State ammonia criteria is derived from EPA criteria. EPA revised the freshwater ambient water criteria for ammonia in 1999.

Ammonia is supplied to the lake from both point and non point sources. However, METRO is the dominant source of ammonia to the upper waters of Onondaga Lake. *Figure 8* shows more than 90% of the lake's ammonia input comes from METRO. This is because the existing facility was never intended to remove significant quantities of ammonia from sewage. However, recent improvements to the METRO system have shown a decline in METRO's annual Average Ammonia Load to Onondaga Lake. The second largest source of ammonia to the lake comes from the most recently active Solvay waste beds located on Nine Mile Creek. Their input represents about 5% of the total ammonia load to Onondaga Lake. ◆

Average Annual Ammonia Contributions to Onondaga Lake (1990-1998) *Figure 8*

Data from Onondaga County Department of Drainage and Sanitation, Onondaga Lake Monitoring Program, Annual Reports, 1990-1997.

Amounts of ammonia vary annually based on inputs and ambient conditions.



Sewage Indicators and Combined Sewer Overflows

10

Is it safe to swim in Onondaga Lake?

Microscopic bacteria and viruses are found in the intestinal tract and feces of human beings. Some of these microorganisms are *pathogenic*, which means they can cause sickness and disease. The contamination of lakes and rivers by fecal material increases the risk that populations using those waters for swimming and other forms of contact recreation will become sick and spread disease. The last beach on Onondaga Lake was closed in 1940 because of public health concerns associated with sewage contamination.

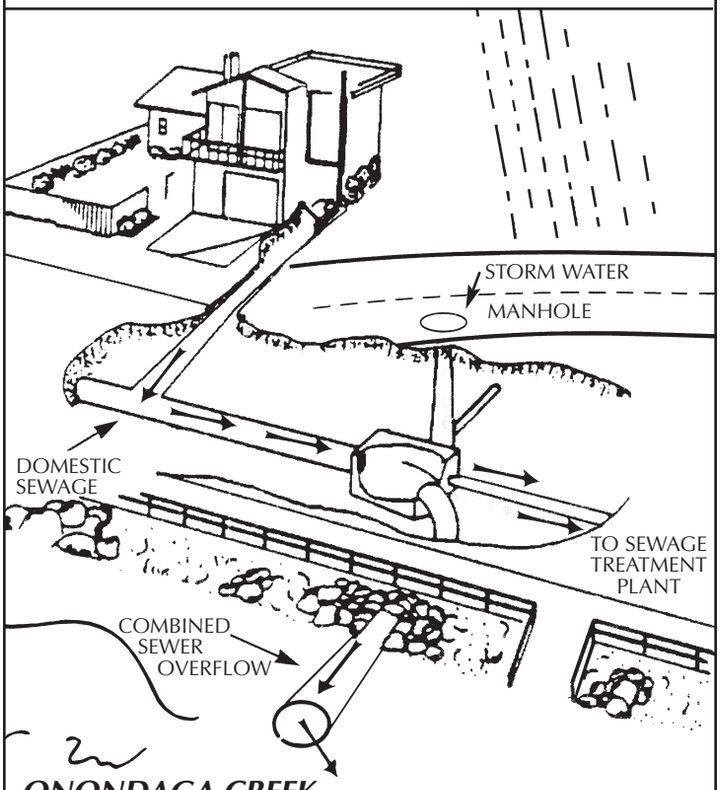
Public health officials use *indicator organisms*, common but harmless bacterial groups, to measure the potential presence of pathogens in water used for swimming or drinking. *Total coliform* and *fecal coliform* groups are the most common indicators because they are present in the digestive tracts of all humans, and their presence in water samples is easy to measure.

The sewers in older cities like Syracuse were built to combine stormwater and sewage. All wastes that reach the METRO plant are disinfected with sodium hypochlorite which kills bacteria and viruses. However, during heavy storms, excess flow from the sewer system never reaches the METRO plant. Instead, untreated diluted sewage and floating debris are discharged into the tributaries of Onondaga Lake through relief structures called combined sewer overflows (CSOs) (*see Figure 9*). A total of 42 CSOs discharge into Onondaga Creek, 19 CSOs discharge into Harbor Brook and two CSOs discharge into Ley Creek.

Public health standards for levels of indicator bacteria are routinely violated throughout the southern half of Onondaga Lake following storm events. After a storm, the water in Onondaga Lake remains contaminated with bacteria from the CSOs for about 3 days. During average summer months there are 18 storms that can lead to about 54 days of violations. These violations prevent the lake from being used for swimming.

To date, three CSOs have been eliminated from Onondaga Creek. Ongoing efforts to mitigate CSOs are discussed on page 20.◆

Combined Sewer Overflows



DURING STORM EVENTS - COMBINED SEWER OVERFLOWS DISCHARGE A MIXTURE OF MUNICIPAL SEWAGE AND STORM WATER RUNOFF INTO ONONDAGA CREEK, HARBOR BROOK AND LEY CREEK

Source: United States Environmental Protection Agency, 1974

Figure 9

Parkland

The public parkland includes biking/walking trails and is host to many area events like the Regatta and Lights on the Lake. More than one million people visit Onondaga Lake each year, making it one of the most visited lakes in Central New York.

Solvay Waste Beds

Salty wastes are discharged to Onondaga Lake from the Solvay waste beds. See page 13 for more information about salinity.

Sainte Marie Among the Iroquois

The $2.3 million year-round attraction is the area's tribute to Onondaga County's Native American and colonial history. The exhibit/museum has attracted thousands of visitors since it opened in August 1991.

Combined Sewer Overflows

CSOs are the main source of bacteria to Onondaga Lake. They cause the lake to violate bacteria standards after heavy rainfall. See page 10 for more information about CSOs.

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Metropolitan Syracuse Wastewater Treatment Plant

METRO is currently the lake's main phosphorus and ammonia contributor. See page 7 for more information on phosphorus and page 9 for information on ammonia.

Onondaga Lake is located just rthwest of Syracuse in the most rban area in Central New York.

Lakefront/Harbor Area

The City of Syracuse and the Lakefront Development Corp. are developing the inner harbor area for recreation and tourism. The Carousel Mall is part of the lakefront development initiative.

Tully Mudboils

Mudboils occur to the south of Onondaga Lake in the Tully Valley. The mudboils are responsible for continuous sediment loading to Onondaga Creek, which has an adverse effect on water quality in the creek and lake. The USGS began remediating mudboil discharge to the creek in 1992. A combination of tributary diversions, dam construction, and depressurizing ground water wells has reduced sediment loads from 30 tons to one half ton per day.

11

Is it safe to eat fish from Onondaga Lake?

Mercury is a metal that is found in a variety of forms. Methyl mercury, formed in aquatic systems through the activity of certain bacteria, is among the most poisonous chemicals known. If all the mercury in the average fever thermometer were converted to methyl mercury, it would be enough to render more than 10,000 one pound largemouth bass unfit for human consumption. Mercury has been measured in the flesh of fish taken from Onondaga Lake at levels that exceed federal food standards.

The Allied chlor-alkali facility discharged an estimated 165,000 pounds of mercury to Onondaga Lake from 1946 until 1970. Mercury loading to the lake was greatly reduced during the period between 1970 and 1988. Scientists estimate that 7 million cubic yards of the lake sediments remain contaminated. As a result, the lake bottom sediments are listed as a hazardous waste site.

Mercury was first detected at dangerous levels in fish from Onondaga Lake in 1970. As a result, fishing was banned that same year. Although fishing is now allowed, the New York State Health Department has issued an advisory against eating fish caught from Onondaga Lake and its tributaries because of mercury contamination. Another reason why contamination of the fishery is a problem of great concern, is because contaminated fish migrate freely between the lake and the Seneca River.

Allied-Signal, Inc. (Honeywell) is completing a series of mercury studies under the direction of the New York State Departments of Environmental Conservation and Law to identify the major sources of mercury to the lake system and recommend ways to eliminate contamination of the fish.

Other toxic substances such as PCB's and chlorinated benzenes have also been detected in the lake ecosystem. Mercury, however, remains the contaminant of most concern because of its persistence in the fish found in the lake. ◆

Health Advisory *(2000-2001)*

FOR ONONDAGA LAKE

- Women of childbearing age, infants, and children under the age of 15 should not eat any species of fish
- No walleye fish should be eaten
- All other species of fish should not be eaten more than one meal (one-half pound) per month

Issued by New York State Department of Health

Tully Valley Mudboils

Onondaga Creek has a murky, muddy-brown appearance especially during periods of high water flow. This is a result of high concentrations of clay and silt in the creek. Most of these materials come from the Tully Valley mudboils located about 15 miles upstream from the mouth of Onondaga Creek.

Mudboils are holes in the earth that discharge mud and soft sediments from underground. They are associated with groundwater flow under pressure. The occurrence of the mud boils have been attributed to AlliedSignal's (Honeywell) solution mining activities in the Tully Valley, although there is some disagreement over this contention. The Onondaga Lake Management Conference conducted field investigations and demonstration projects in the Tully Valley to address the problems the mudboils are causing in Onondaga Creek.

Newspapers reported mudboils in Tully as early as 1899. Anecdotal information indicates the amount of sediments discharged to Onondaga Creek from these phenomena has increased over the years. According to the United States Geological Survey, (USGS), the average sediment loading to Onondaga Creek from the mudboil area between October 1991 and March 1992 was approximately 30 tons per day.

Much of the Onondaga Creek stream bed downstream from the mudboil area is covered with sediments discharged from the mudboils. The muddy sediments reduce habitats suitable for aquatic insects and other bottom life, fish spawning and plant growth in Onondaga Creek; and significantly contribute to the sediment loading to Onondaga Lake. Onondaga Creek contributes more than 50% of the annual tributary sediment load to the lake due in large part to the mudboils.

Mudboil discharges sediment to Upper Onondaga Creek

Tully Valley mudboil

Since 1992, the Onondaga Lake Management Conference has supported USGS activities in the diversion of surface water away from the mudboils, the installation of a dam on the stream that flows from the mudboil area and the drilling of wells to reduce pressure around the mudboils. These efforts have been successful in reducing the amount of sediment flowing into Onondaga Creek to about one-half ton per day. ◆

13

Is Onondaga Lake naturally salty?

The concentration of dissolved salts in water is referred to as *salinity*. The water in the oceans, which is about 3.5% salt by weight, is extremely salty compared to fresh waters. Otisco Lake, a hardwater lake also located in Onondaga County, has a salt content of about 0.03%, nearly 120-times lower than the ocean. Before the Solvay Process Company (later Allied Chemical and Dye Corp., Allied Chemical Corp., Allied Corp., Allied-Signal Inc., AlliedSignal Inc. and now Honeywell International, Inc.) closed in 1986, the salt content of Onondaga Lake was unusually high, averaging 0.30% (*see Figure 10*). This was 10-times greater than Otisco Lake.

Some Central New Yorkers believe that most of the lake's salt concentration results from natural inputs from nearby salt formations. This may seem plausible considering that the eastern and southern shores of Onondaga Lake supported a flourishing salt mining industry in the 1800s. However, it is important to understand that the salt mined in Syracuse during the 19th Century was taken from springs and wells located near the lake shore, not from the lake water.

Approximately 6 million pounds of salty wastes, made up of chloride, sodium, and calcium were discharged daily to Onondaga Lake from the Solvay Process soda ash facility before it closed. Continued scientific measurements of the salt concentrations in the lake and tributaries following the closure of the facility established that earlier assessments of "natural" salt contributions to Onondaga Lake were greatly over-estimated.

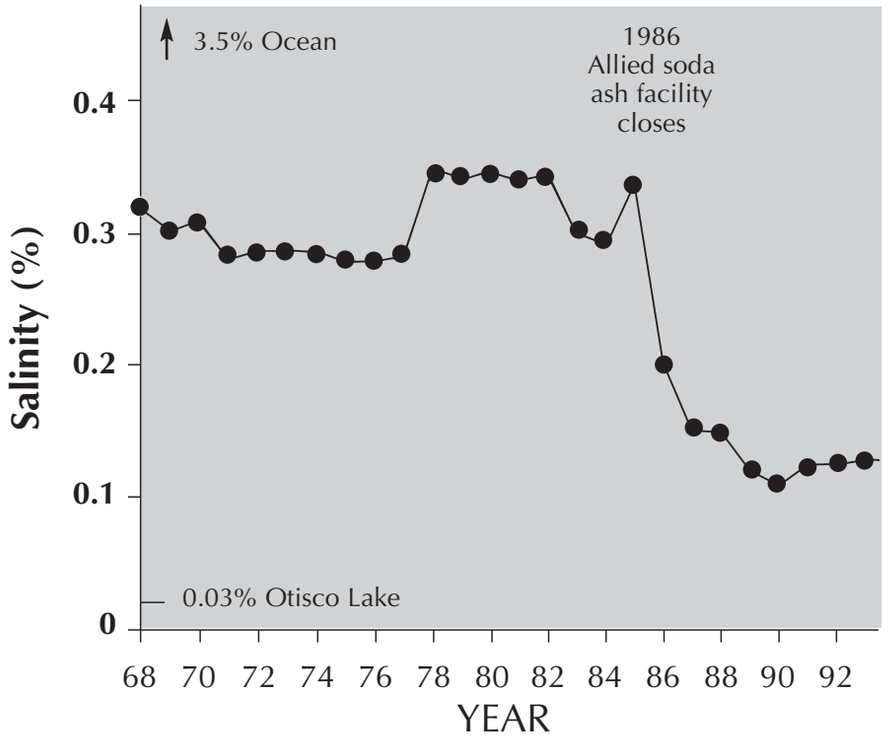
The concentration of *chloride,* the most important component of salinity to Onondaga Lake, has decreased from 1600 milligrams per liter to less than 400 milligrams per liter since the closure of the Allied soda ash facility. The salt content of the lake is presently about 0.10% by weight, a three-fold reduction since the soda ash facility closed. This level is still artificially high because salty wastes are still entering Onondaga Lake from the Solvay waste beds located along Nine Mile Creek (*see Figure 11*). Elimination of continued salt pollution inputs from the waste beds would result in reductions in the chloride concentrations of the lake to less than 250 milligrams per liter. Without this loading, the total salt content of Onondaga Lake could approach 0.05%, which is much closer to the levels of other freshwater lakes in the area.

Impacts of Soda Ash Production

The discharge of salt and other wastes associated with the production of soda ash has had far-reaching impacts on Onondaga Lake and the adjoining Seneca River system. The lake's elevated salinity reduced the diversity of its aquatic life. High concentrations of calcium discharged to the lake from soda ash production increased the *calcium carbonate* for-

Salinity in Onondaga Lake

Figure 10

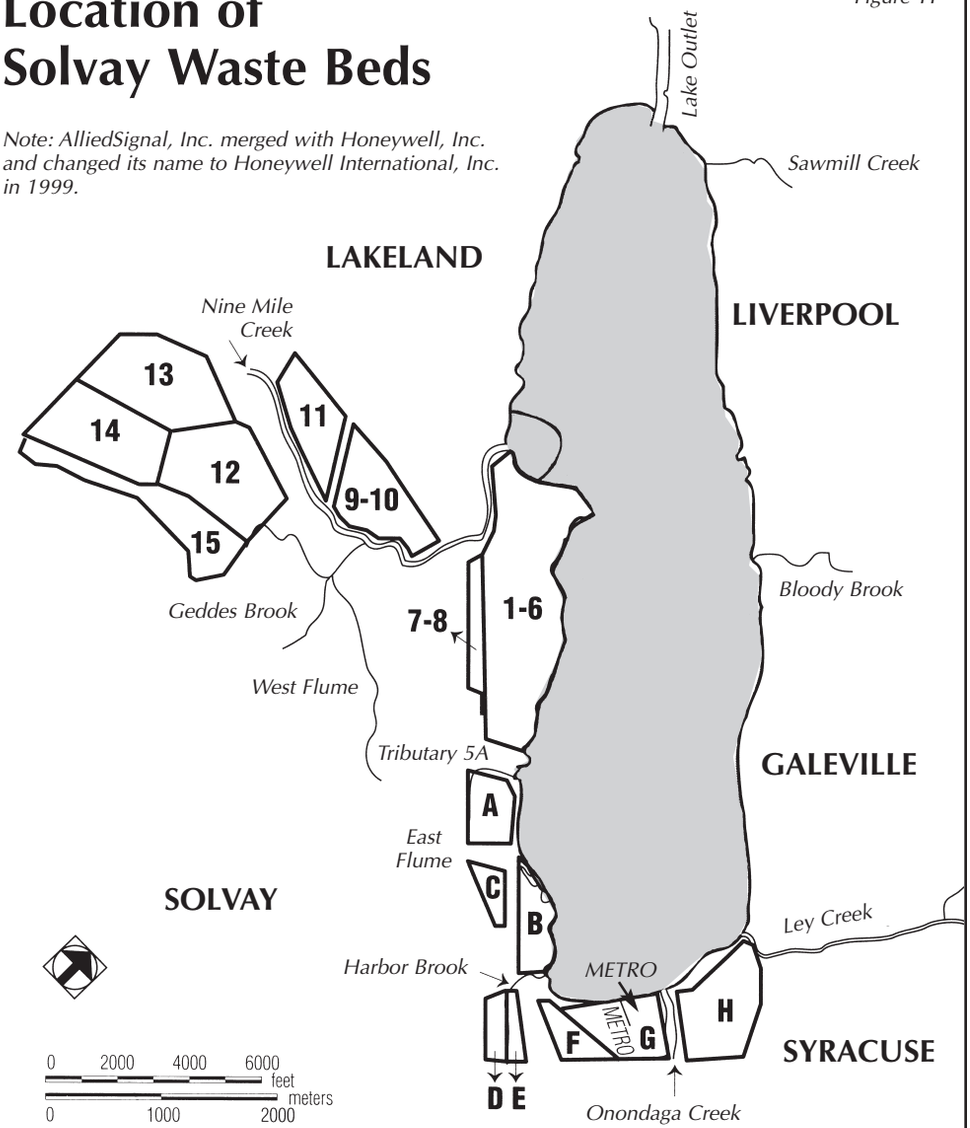


mation rate, resulting in excessive lake bottom accumulations. These deposits have accelerated the rate at which Onondaga Lake is filling in and eliminated habitats suitable to support a normal nearshore biological community. Because salty water is denser than fresh water, high salt loadings (especially during facility operations) also altered the natural stratification cycle in Onondaga Lake. The Seneca River, a moving body of water that ordinarily should not stratify throughout the year, also experiences chemical stratification as a result of receiving denser, salty water from Onondaga Lake. The stratification in both the lake and the river contributes to a decline in the oxygen levels in both bodies of water. ◆

Location of Solvay Waste Beds

Figure 11

Note: AlliedSignal, Inc. merged with Honeywell, Inc. and changed its name to Honeywell International, Inc. in 1999.

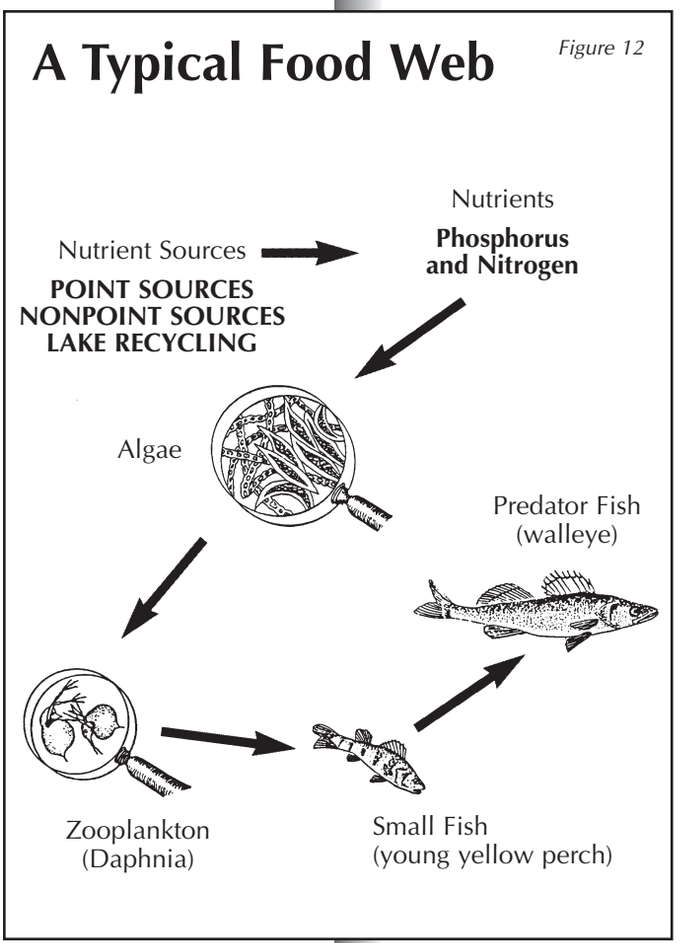


Source: Blasland, Bouck and Lee (1989)

Waste bed deposits prior to 1930 are lettered. Waste beds with high numbers are most recent.

Plants and Animals

15



Plants and animals perform certain functions in Onondaga Lake. Their life processes act like a wheel powered by the sun converting energy from one form into another. Each living creature has a function that is completely codependent on interactions with other creatures residing in the lake. Their interactions are referred to as a *food web* (*see Figure 12*).

The Lake Ecosystem

While there is an abundance and variety of algae, there are limited species of rooted aquatic plants in Onondaga Lake. Plants use sunlight to turn materials, such as phosphorus, nitrogen, carbon dioxide and water, into new branches, roots and leaves. Green plants also produce oxygen as a by-product.

Two factors appear to have contributed to the limited growth of rooted aquatic plants in Onondaga Lake, the cloudiness of the water and the unusual character of the nearshore sediments. Much of the area is covered with calcium carbonate stones called *oncolites*. Scientists who have investigated the oncolite phenomenon in Onondaga Lake have concluded that the high abundance of oncolites are related to the salt waste discharges of the soda ash facility during its operation.

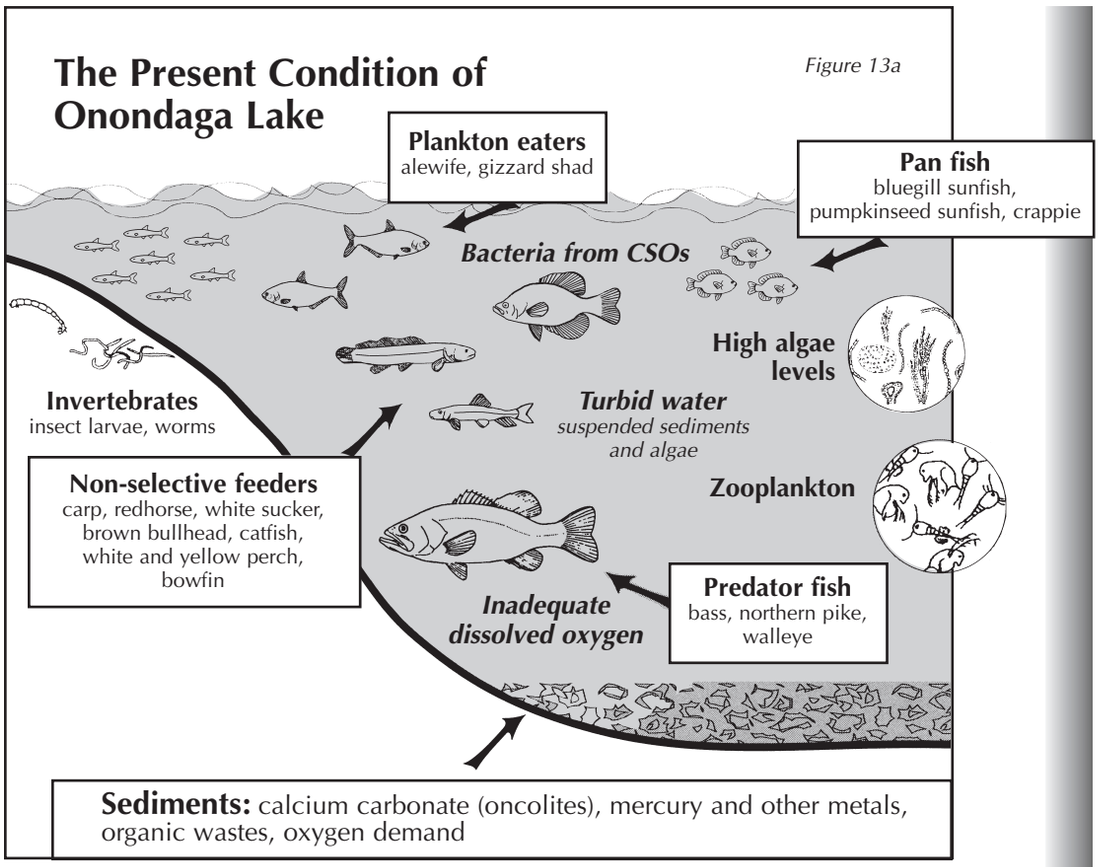
The scarcity of rooted vegetation greatly limits the populations and variety of animal species found in Onondaga Lake. Small fish, for example, which camouflage themselves among aquatic plants along the shoreline for protection, are easily consumed by the lake's predator fish. Rooted plants also hold down muds and sediments in the lake like they do on land.

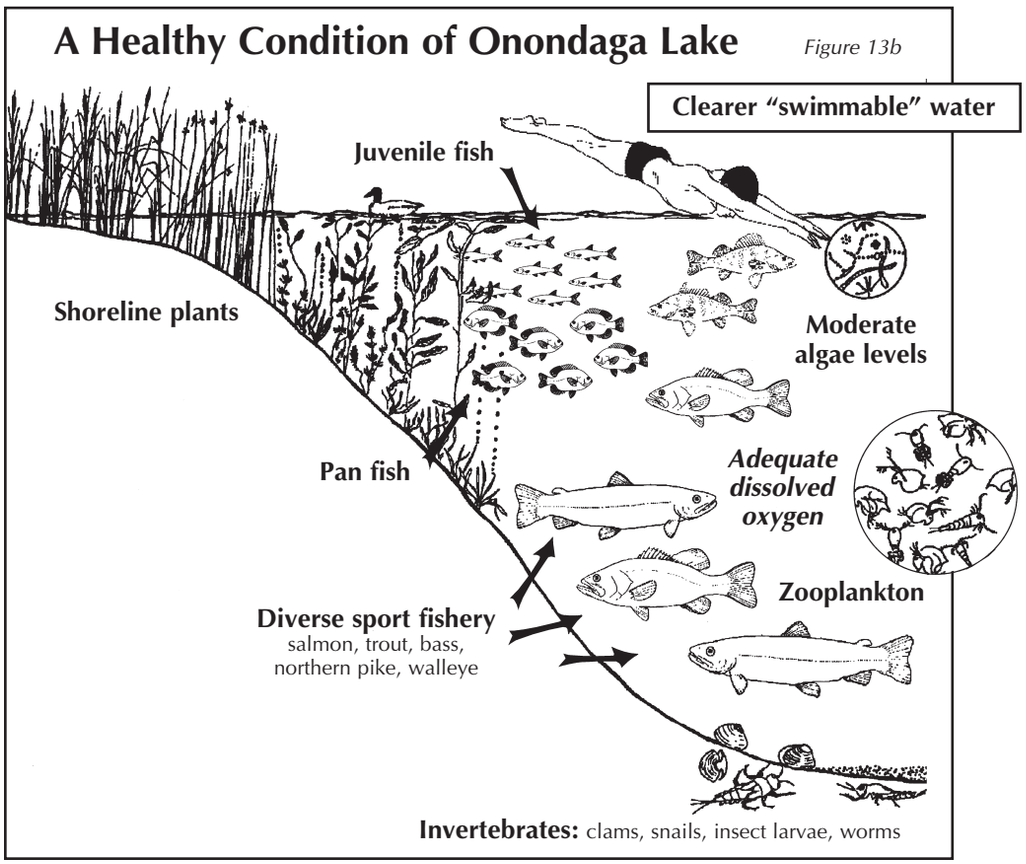
Much of the plant life in the open waters of Onondaga Lake is microscopic and drifts with the movement of the water. The food web in the open water consists of algae, zooplankton and fish. *Zooplankton* include crustaceans and other small animals without backbones called *invertebrates*. *Crustaceans* are the freshwater relatives of shrimp and lobsters (under a microscope they look quite similar). Bacteria and fungi also thrive in the open water area.

Because some zooplankton eat algae, they are important in regulating algae concentrations in many lakes. Scientists speculate that algae-eating zooplankton have become more important because of the decrease in the lake's salt concentrations since the soda ash facility closed.

Algae, zooplankton and other organic matter that sink to the bottom of the lake are decomposed by bacteria and fungi living in the deep water. *Bacteria* and *fungi* break down the organic matter releasing key nutrients such as phosphorus and nitrogen into the overlying water.

Invertebrates, such as worms and insect larvae, are also important in the consumption of settled organic matter in many lakes. The makeup of the invertebrate community in the nearshore area of Onondaga Lake reflects the impact of its extensive history of pollution. Examination of the lake's deep water sediments has not revealed the presence of any invertebrates. This is consistent with the absence of dissolved oxygen and the presence of waste materials in the deep water areas. ◆





Water Quality and the Ecosystem

Presently, Onondaga Lake has a low number of rooted aquatic green plants because of cloudy water and the prevalence of calcium carbonate sediments that cover a majority of the lake's shoreline. High concentrations of algae reduce the lake's water clarity and oxygen resources. These conditions limit desirable game fish species in Onondaga Lake (see Figure 13a).

Eliminating pollution inputs such as phosphorus, ammonia, mercury, salt and sediments would improve the water quality of Onondaga Lake. This would diversify the Onondaga Lake ecosystem and its uses (see Figure 13b). Shoreline plants would provide a habitat for fish spawning. Fish would have adequate dissolved oxygen, and thrive in the lower waters of the lake.

The Onondaga Lake Cleanup Corp. through the OLP has been working to improve the habitat and aquatic plants along the shore of Onondaga Lake. Fish spawning areas and new plants have been installed and monitored by scientists hoping to restore fish reproduction in the lake. These efforts continue in conjunction with New York State's claim for natural resource damages from Allied-Signal Inc. as part of the legal actions taken against the company. ◆

The Lake's Fishery

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Fish Information

Walleye-*Found in the lake and outlet; most run 4-7 lbs, 76% of walleye exceed 1ppm of mercury.**

Smallmouth Bass-*Most abundant game fish in the lake. Fish topping 4 lbs, 81% of smallmouth bass exceed 1 ppm of mercury.*

White Perch-*Abundant throughout the lake and easy to catch. Most run about 6 inches long, 20% of white perch exceed 1 ppm of mercury.*

Channel Catfish-*Fairly common throughout the lake. Catfish over 20 lbs have been sighted, 20% of channel catfish exceed 1 ppm of mercury.*

Northern Pike-*Populations are increasing along with expanding weed beds, 20% of northern pike exceed 1 ppm of mercury.*

Carp-*Although no longer dominant, some 25 lb carp still frequent the shoreline, 14% of carp exceed 1 ppm of mercury.*

Brown Bullhead-*Common in the lake outlet and popular during late spring. No brown bullhead exceed 1 ppm of mercury.*

Yellow Perch-*Uncommon now, but populations will increase as lake conditions continue to improve, 6% of yellow perch exceed 1 ppm of mercury.*

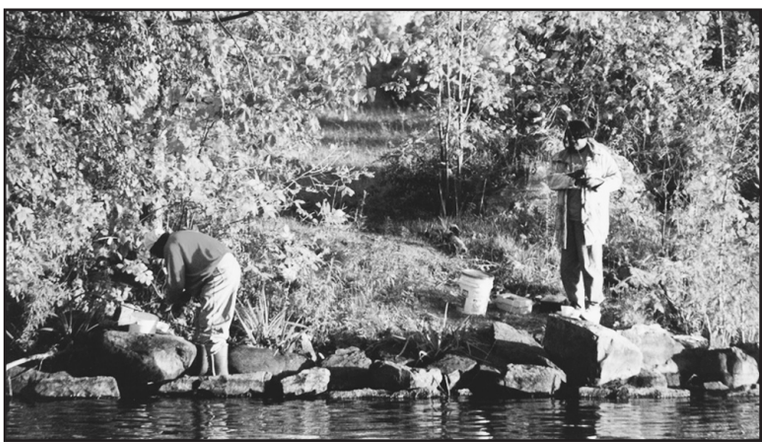
Pumpkinseed and Bluegills-*Abundant and will support any number of days of successful fishing, 6% of pumpkinseed exceed 1 ppm of mercury.*

Sampling efforts have identified 52 different fish species in Onondaga Lake.

Historically, Onondaga Lake and its tributaries supported a unique and productive cold water fishery that included migratory Atlantic salmon. Ciscoes were so prolific in Onondaga Lake, they became known as the Onondaga Lake Whitefish, a delicacy that graced many menus in Syracuse and New York City in the 1800's. Lake sturgeon and burbot were also part of the watershed's early fish life.

But, the character of Onondaga Lake's fishery has changed dramatically over the years. During the past century, industrial pollution, urbanization and sewage brought lower levels of dissolved oxygen, turbidity, elevated ammonia concentrations, salinity and mercury contamination to Onondaga Lake. These factors reduced plant life in both the lake and its tributaries, causing changes in available fish spawning areas. By 1920, both Atlantic salmon and Onondaga Lake Whitefish no longer thrived in Onondaga Lake.

As a result of its extensive history of pollution, many people think of Onondaga Lake as a bowl of chemical soup sprinkled with algae and mud. In their minds, such a lake cannot possibly support any fish life. Contrary to the popular myth, evaluations of the fish in Onondaga Lake have documented surprisingly diverse warm water fish species



The lake's shoreline provides good sites for catch and release fishing for area residents.

Smallmouth bass caught in Onondaga Lake.

in the lake throughout most of the year.

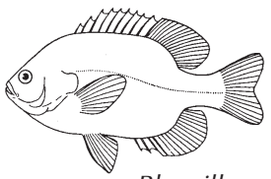
Recent sampling efforts have identified a total of 52 different fish species in Onondaga Lake. The species present include desirable sport fish such as largemouth and smallmouth bass, walleye and northern pike. Larger populations of golden shiner, white perch, gizzard shad, bluegills and pumpkinseed sunfish can also be found near the lake's shoreline, which provides some good sites for catch and release fishing for area residents. The increasing populations and varieties of fish reflect a vast improvement from conditions in the 1950s when fishery surveys showed that more than 90% of the total fish in Onondaga Lake were common carp. In 1972, surveys identified only 9 different species and in 1946, 13 species were recorded.

The Onondaga Lake fishery is currently made up of both year-round residents and many species that migrate in and out of the lake depending on changes in lakewide oxygen levels. During fall turnover, for example, fish like smallmouth bass and walleye migrate through the lake outlet to the Seneca River in order to survive the low oxygen periods.

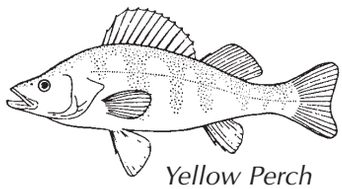
If species such as smallmouth bass and walleye are to survive year-round in the lake, its deeper waters must consistently support higher levels of oxygen and better habitats with more plant life. Habitats in the tributaries where fish could spawn would also need to be improved. ◆

To protect human health, the Federal Food and Drug Administration has set an action level for mercury contamination in fish at 1 ppm for United States commercial markets. The New York State Department of Health adopts this limit for establishing recreational fishing consumption advisories.

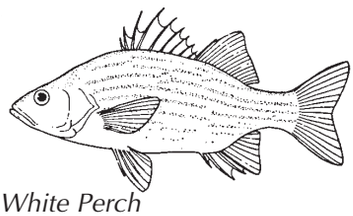
Fish in Onondaga Lake



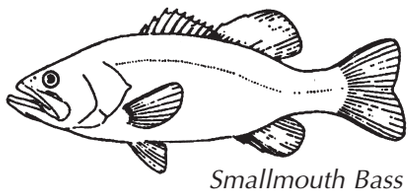
Bluegill



Yellow Perch



White Perch



Smallmouth Bass

Figure 14

19

Determining the Lake's Future

Congress passed legislation in 1990 forming the Onondaga Lake Management Conference consisting of representatives from local, state and federal governments. Congress mandated that the Management Conference develop and implement a strategy for restoring Onondaga Lake. The Management Conference drafted a Plan for Action in 1993 that outlined recommendations for lake restoration. The Amended Consent Judgment (ACJ) [as described in detail on pg. 20] was signed in 1998. The Management Conference formally adopted the ACJ as part of its cleanup strategy in 1999; inconsistencies with the ACJ were dropped from the Plan for Action. Legislation was enacted in 1999 that replaced the Management Conference with the Onondaga Lake Partnership on August 17, 2000. The U.S. Army Corps of Engineers leads the Partnership. The Partnership provides a framework for local, state and federal governments to cooperate in restoring Onondaga Lake.

MAJOR RESTORATION ISSUES

- ✓ Phosphorus and ammonia loading from METRO must be reduced pursuant to the ACJ in order to meet water quality standards, thereby lowering toxicity, limiting algal growth, increasing oxygen levels and improving water clarity.
- ✓ Floatable solids and bacterial discharge from CSOs must be reduced pursuant to the ACJ in order to meet water quality standards and improve health conditions.
- ✓ Sources of mercury and other industrial contaminants must be identified and controlled to meet health standards and reduce impacts on the Onondaga Lake fishery.
- ✓ Saline runoff and leachate from the Solvay Wastebeds to Nine Mile Creek and the lake must be ameliorated.
- ✓ Tully Valley mudboil control must be maintained to improve water quality in Onondaga Creek and the lake.
- ✓ Pollution from rural and urban nonpoint source runoff must be reduced throughout the watershed.
- ✓ Effects of wave erosion, oncolite formation and sediment contamination must be mitigated.
- ✓ Natural habitats suitable for the growth of rooted aquatic plants and the propagation of aquatic species must be restored.

Figure 15

The information outlined in this booklet describes how the cleanup of the lake will proceed. Environmental law clearly defines water quality standards; some are numerical, others are narrative. Once compliance with environmental law is reached, the public will help determine how Onondaga Lake will be used. The water quality of Onondaga Lake and its inner harbor will influence how the waterfront is developed, whether there will be beaches, restaurants, marinas or perhaps a museum.

Today, the Onondaga Lake Partnership asks the people of Onondaga County to believe in the future of Onondaga Lake. Recent events have rekindled hope for recreational use of the waterfront.

The City of Syracuse is proceeding with the redevelopment of the 800 acres separating downtown from the waterfront. Public and private investments have begun transforming the area known as Oil City. The Carousel Center regional shopping mall, built on the site of a former scrap yard, was the largest commercial development undertaken in Central New York. Also, the creation of an urban neighborhood called Franklin Square is an equally remarkable accomplishment.

Onondaga County has a long history of promoting recreation around the lake. The County hopes one day to complete the bikeway encircling the lake and to upgrade the Onondaga Lake parklands and marina.

The City of Syracuse is also continuing to develop the area at the southern end of the lake known as the Inner Harbor. This includes plans to transform the barge canal terminal area into a bustling harbor and marina complex. Construction of an aquarium and visitor's center also is being pursued. The harbor project is expected to draw tourists and attract additional commercial development to Onondaga Lake. The potential for development of the Onondaga Lake waterfront will be closely linked to water quality improvements in Onondaga Creek, the harbor and throughout the lake. As the lake cleanup continues to move forward, businesses and developers are responding positively to the potential for development in this urban waterfront.

What Lies Ahead

Figure 15 lists the main problems facing Onondaga Lake. These are the focus of the cleanup effort described on the following pages. Solving these problems will not be easy. The lake forms a complex ecosystem influenced by a myriad of diverse physical, chemical, and biological factors. The goal is to restore the lake's ecological integrity. With its extensive history of abuse, cleanup will not happen overnight. Restoration of one of the most perturbed lakes in America will be challenging, but with support from the people of Onondaga County this challenge can be met. ◆

METRO and CSO Upgrades

Onondaga County must upgrade METRO and reduce combined sewer overflows.

Improving Sewage Treatment

On January 20, 1998, an Amended Consent Judgment (ACJ) was entered by Federal District Court in the Northern District of New York. The ACJ requires Onondaga County to upgrade the existing sewage treatment system and construct new facilities and conveyances so that effluents from METRO and the CSOs comply with the state permit discharge limits and water quality standards. The agreement entered into by New York State, the Atlantic States Legal Foundation and Onondaga County mandates a schedule of specific abatement, monitoring, reporting and other actions to be implemented in stages by Onondaga County in order to meet water quality standards in Onondaga Lake consistent with parameters established by the Clean Water Act.

The ACJ is designed to achieve full compliance with the Clean Water Act by December 1, 2012. It outlines a fifteen year schedule of phased upgrades to METRO and the CSOs. It also requires an extensive monitoring program for Onondaga Lake, its tributaries and the Seneca River to measure water quality improvements.

The sewage treatment improvement projects in the ACJ are being implemented in three stages:

Stage I: The County must limit ammonia, phosphorus and CSO discharges to the 1997 level of treatment.

Stage II: By May 2004, the County must reduce the amount of ammonia released at METRO to 2 milligrams per liter (mg/L) in summer and 4 mg/L during the winter. By April of 2006, the amount of phosphorus discharged from METRO must be reduced to 0.12 mg/L. CSO treatment devices, called swirl concentrators, must also be built at several locations to kill bacteria and remove sewage solids from the overflows.

Stage III: No later than February 2009, New York State Department of Environmental Conservation (DEC) will evaluate the effectiveness of Stage II projects and the feasibility of meeting the Stage III requirements in the ACJ. Stage III projects are to be completed by December 2012 and require METRO to reduce ammonia levels to 1.2 mg/L in the summer and 2.4 mg/L in the winter. Phosphorus from METRO must be lowered to 0.02 mg/L. CSO construction projects must also be completed by 2012. If, in 2009, the DEC determines that Stage III ammonia and/or phosphorus limits are not technically possible, then the ACJ requires the County to implement another engineering alternative which fully complies with water quality standards for the lake. By December 2012, METRO and the CSOs are expected to meet discharge limits that comply with the Clean Water Act.

Current Status: Onondaga County is proceeding with implementing the ACJ and meeting all ACJ requirements. Many of the CSO projects are complete or underway. A combined ammonia and phosphorous removal program is ongoing at the METRO facility. The program will acheive Stage III effluent discharge limits for ammonia (8 years early) and the Stage II effluent discharge limit for phosphorous (2 years early) by May 1, 2004. At the current schedule, the County will complete over three fourths of the ACJ required projects by the year 2008. ◆

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Addressing Sewage Pollution

The Onondaga Lake Partnership asks the people of Onondaga County to believe in the future of Onondaga Lake.

Industrial Waste Cleanup Efforts

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Allied-Signal (Honeywell)

Allied Corp. closed its Syracuse facilities in 1986. On June 27, 1989, New York State filed a lawsuit against Allied-Signal Inc., alleging past and continuing contamination of Onondaga Lake. The State's claims for remediation and cleanup costs are based on the common law of public nuisance and the New York State Environmental Conservation Law, but center on the federal Comprehensive Environmental Response Compensation and Liability Act, commonly known as *Superfund*. The lawsuit also includes a claim for Natural Resources Damages that addresses Allied's historic and continuing degradation of the lake.

In January 1992, the State and Allied-Signal, Inc. signed an interim Consent Decree detailing the elements of a Remedial Investigation and Feasibility Study (RI/FS) of the lake to be conducted by Allied-Signal. The RI/FS will assess wastebed related impacts to the lake, in addition to mercury and toxic organic contamination of the lake's ecosystem associated with the company's operations.

Allied-Signal submitted draft reports for most elements of the RI/FS to the

Contaminated Lake Sediments: Covered with calcium carbonate from Allied soda ash production, >4 feet of mercury contaminated sediment estimated at 7 million cubic yards.

Maestri 2 (Val's Dodge): Disposed of garbage and mill scales from Crucible Steel operation in Solvay. Class 2 NYS Inactive Hazardous Waste Site (see sidebar right)*

Honeywell (formerly Allied-Signal) Waste Beds 9-15: Contribute salts to the lake, >1000 acres of land. Low levels of chlorobenzene detected near some beds.

LCP Bridge Street Facility: Site of former chlorine production. Class 2 NYS Inactive Hazardous Waste Site.

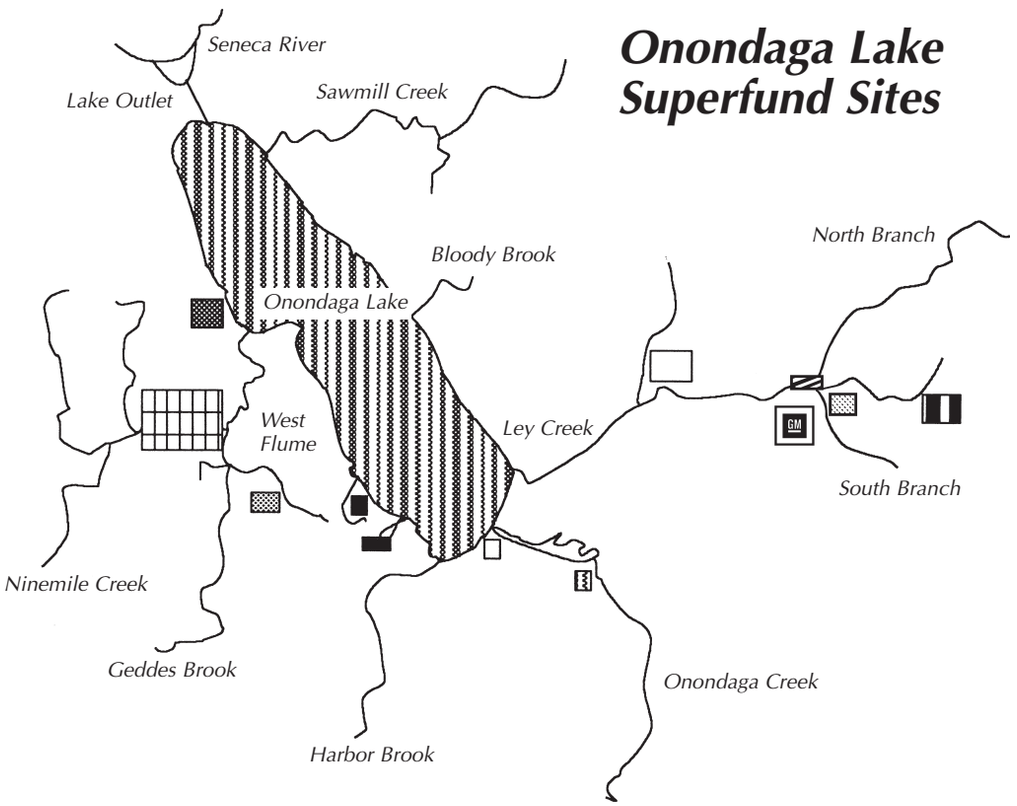

Figure 16

Honeywell (formerly Allied-Signal) Semet Tar Beds: Disposed 50-70 million gallons of acidic tar-like wastes from former benzene production plant, 22 acre site.

Honeywell (formerly Allied-Signal) Semet Willis Avenue Facility: Groundwater contamination from chemical manufacturing.

NIMO Gas Plant: Burned coal to produce gas for lighting. **METRO** currently occupies the majority of 23 acres.

State, and the State is reviewing this material. The State is also planning to conduct a Natural Resources Damage Assessment (NRDA) of the lake. When the RI/FS and NRDA are complete, the DEC Commissioner will select the appropriate remedies that need to be implemented in Records of Decision.

Other Responsible Parties

In addition to the former Allied facilities and property, the Superfund law is being used to address a number of other contaminated areas in the watershed (*see figure 16*). In December 1994, a collection of sites including the lake bottom were added to the federal Superfund National Priorities List (NPL). In 1995, EPA authorized DEC to conduct a preliminary site investigation of the Onondaga Lake NPL site. The Onondaga Lake NPL site includes a number of smaller sites owned by Allied-Signal (Honeywell) and other potentially responsible parties (PRP). Today, the DEC is evaluating 10-15 additional sites that are not owned by Honeywell, to determine if they should be included in the overall Onondaga Lake Superfund site.

All of these industrial waste sites are in various stages of investigation or remediation. Allied-Signal (Honeywell) and some of the other PRPs have signed administrative consent orders agreeing to proceed with interim remedial measures at some of the sites. Some PRPs are conducting RI/FS's on their respective sites. Still others are awaiting a determination of the status of their site(s) based on the results of DEC's preliminary site investigation. Eventually the DEC will issue separate Records of Decision on each of the Onondaga Lake Superfund sites. ◆

General Motors (GM): Used PCBs in auto manufacturing. Class 2 NYS Inactive Hazardous Waste Site.

Salina Town Landfill: Closed and capped in 1982. Class 2a NYS Inactive Hazardous Waste Site due to PCBs.

Ley Creek PCB Dredgings: More than 4,000 feet dredged along Ley Creek. PCBs found in dredgings from GM-Fisher Guide plant.

Lockheed-Martin (Formerly GE) Site: Used nine 250 gallon underground storage tanks to dispose of solvents. Tanks removed in 1986. Contaminated soil removal and storm drain rehab have occured.

Carrier/Carlyle Facility: Manufactured reciprocating compressors. 60 acre Class 3 NYS Inactive Hazardous Waste Site due to groundwater contamination.

American Bag: Scrap metal and insulated cable business. Class 2a NYS Inactive Hazardous Waste Site due to PCBs.

NYS INACTIVE HAZARDOUS WASTE SITE CLASSIFICATIONS

Class 1.	Causing/presenting imminent danger or irreparable damage to the public health or environment - immediate action required.
Class 2.	Significant threat to public or environment - action required.
Class 2a.	Temporary classification for sites that have insufficient data.
Class 3.	Does not present significant threat - action may be deferred.
Class 4.	Site properly closed - requires continuous management.
Class 5.	Site properly closed - no further action required.

Bathymetric Map of Onondaga Lake

Onondaga County, New York